

A SECOND enlarged edition of Prof. A. Fischer's admirable "Vorlesungen über Bakterien" has been published by the firm of Gustav Fischer, Jena. The first edition was published in 1897, and was very favourably reviewed in these columns (vol. lviii. p. 77, 1898). The book is now double the size of the original volume, the number of pages having been increased from 186 to 374. Its value as a scientific treatise on bacteriology has thus been increased, and students of the subject may turn to the book with confidence that they will find the present state of knowledge of bacteriological science satisfactorily represented in it.

THE additions to the Zoological Society's Gardens during the past week include a Bosman's Potto (*Perodicticus potto*) from West Africa, presented by Captain Jas. Startin, R.N.; a Rhomb-marked Snake (*Trimerorhinus rhombeatus*) from South Africa, presented by Mr. George Vanderspar; six Marbled Newts (*Molge marmorata*), three Palmated Newts (*Molge palmata*), three Brown Newts (*Spelerpes fuscus*), European, deposited; two Herons (*Ardea cinerea*), European, received in exchange.

OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES IN APRIL:—

- April 6. 10h. 11m. Minimum of Algol (β Persei).
 9. 11h. 48m. to 12h. 23m. Moon occults ν Leonis (mag. 4.5).
 9. 15h. 16m. to 18h. 48m. Transit of Jupiter's Sat. III. (Ganymede).
 11. Moon partially eclipsed visible at Greenwich:—
 10h. 34.4m. First contact with the shadow.
 12h. 13.0m. Middle of the eclipse.
 13h. 51.6m. Last contact with the shadow.
 Magnitude of the eclipse (ν 's diameter = 1) = 0.973.
 15. Venus. Illuminated portion of disc = 0.832.
 Mars = 0.985.
 20-22. Epoch of Lyrid meteoric shower (Radiant 271° + 33').
 26. 11h. 54m. Minimum of Algol (β Persei).
 29. 8h. 43m. Minimum of Algol (β Persei).

STELLAR PARALLAX.—The *Transactions* of the Astronomical Observatory of Yale University (vol. i. part vi.) contain a valuable determination of the parallax of the ten first magnitude stars in the northern hemisphere by Dr. W. L. Elkin, the director of the Observatory. This investigation is part of a scheme for making a series of researches on the parallaxes of stars of successive orders of magnitude with the Yale heliometer, and was begun in the year 1885. In the volume before us Dr. Elkin gives details of the method of measurement adopted, the several series and comparison stars, the observations and reductions, and finally a discussion of the results. Referring here only to the actual results he obtained, the following table gives the adopted values of the parallax of each of the stars, with their probable errors:—

	Adopted Parallax.	Probable Error.
α Tauri	+0.109	± 0.014
α Aurigæ	0.079	0.021
α Orionis	0.024	0.024
α Can. Min.	0.334	0.015
β Geminorum	0.056	0.023
α Leonis	0.024	0.020
α Bootis	0.026	0.017
α Lyreæ	0.082	0.016
α Aquilæ	+0.232	0.019
α Cygni	-0.012	± 0.023

MEASURES OF SATURN'S RINGS.—A series of measurements of the distance between the inner edge of the inner ring of Saturn and the planet itself has been made by Prof. F. E. Seagrave, of Providence. The mean result obtained shows a distance of 3".698 on the preceding side and 4".005 on the

following side, and the diameter of the planet itself is given as 17".618.

A comparison of this result with the mean of the results obtained by previous observers shows that there is no proof of the theory, first advanced by M. Struve in 1851, that the inner ring of the planet was expanding inwards, and that consequently the space between it and the planet was decreasing (*Popular Astronomy*, No. 103).

OBSERVATIONS OF JUPITER'S FIFTH SATELLITE.—In *Bulletin* No. 28 of the Lick Observatory, Prof. R. G. Aitken gives the details of the measurements made during 1900 and 1902 at the Lick Observatory of the positions of Jupiter's fifth satellite.

In each set of observations the position of the satellite is referred to that of one of the others, and the time of observation, the position angle, the distance in seconds and the number of settings are given in tabular form.

The satellite was observed on ten nights, a magnifying power of 270 being used during 1900, and a power of 350 during 1902. During the former period the planet itself was occulted by means of a drop of Indian ink on a clear glass plate placed between the micrometer threads and the eye-piece, but during 1902 a piece of suitably placed smoked mica was substituted for the glass plate.

OBSERVATIONS OF THE LIGHT OF NOVA PERSEI.—The second publication, by the Harvard College Observatory, of the variations in the magnitude of Nova Persei occurs in vol. xlviii. (No. 2) of the *H.C.O. Annals*.

About three thousand six hundred magnitude observations have been compiled from various sources by Mr. Leon Campbell, under the direction of Prof. O. C. Wendell. The time of observation, the original comparison stars (when available), the magnitude of the Nova reduced to the Harvard photometric scale, the name of the observer and a reference number to the publication in which the observation was originally recorded are given for each observation, and the observations are set out in chronological order.

NEW CATALOGUE OF DOUBLE STARS.—A sixth catalogue of one hundred double stars, discovered by Mr. W. J. Hussey whilst using the 12-inch and 36-inch Lick refractors, is contained in *Bulletin* No. 27 of the Lick Observatory. The previous five catalogues, each containing the names, positions and particulars of one hundred new doubles, have appeared in earlier numbers of the *Astronomical Journal* and the *Lick Bulletins*.

Mr. Hussey calls special attention to two of the stars in the present catalogue, Nos. 507 and 580 respectively. No. 507 (D.M.+49°.95) is a remarkable triplet the components of which are of nearly equal magnitude (A.=9.3m., B.=9.5m., C.=9.8m.) and form an equilateral triangle, and the observer suggests that the measurements thereof should form a conclusive test for determining personal equations. No. 580 (ι Serpentis) is a probable binary the components of which are equal in magnitude (5.0m.) and the proper motion exceedingly small, viz. -0.00477s. and -0.00582s.

MAGNETIC OBSERVATIONS DURING ECLIPSES.—Dr. L. A. Bauer, of the Coast and Geodetic Survey, Washington, has collected all the available observations of the magnetic variations which are shown to take place during a total eclipse of the sun, and has published them in No. 4, vol. vii. of *Terrestrial Magnetism and Atmospheric Electricity*.

It is suggested in the preface to the article that the eclipse variation of the magnetic needle is analogous to the common diurnal variation, and that the causes of the two phenomena are also analogous, inasmuch as the diurnal variation may be caused by the continual eclipse of that side of the earth which, for the time being, is turned away from the sun. For this to be the case we have to premise that these variations are caused by some undetermined radiation from the sun which affects the magnetic needle.

This suggestion is supported by the following result deduced from the collected observations, which refer to every eclipse that has taken place since 1870:—"The precise effect of the eclipse magnetic variation is (1) opposite in the two magnetic hemispheres; (2) opposite for the morning and afternoon hours." In other words, "the nature of the eclipse variation is analogous to that of the diurnal variation, differing from it only in degree."

Supposing that the magnitude of the effect produced varies

proportionately with the amount of sunlight cut off, the earth and moon should produce effects inversely proportional to the square of their diameters, *i.e.* $13'5:1$, and in analysing the collected data Dr. Bauer finds that the ratio of the diurnal variation to the eclipse variation is of this order, thereby supporting the theory set forth in the preface.

THE SOLIDIFICATION OF FLUORINE AND THE COMBINATION OF SOLID FLUORINE WITH LIQUID HYDROGEN.¹

IN preceding researches we have shown that fluorine is liquefied at -187°C. , and that, at this low temperature, it acts neither upon crystallised silicon, amorphous carbon, boron nor mercury; that, in short, its chemical activity is diminished, but that it still combines with production of flame with hydrogen and solid turpentine.

These researches have been continued since one of us has been able to obtain hydrogen in the form of a stable liquid boiling at $-252^{\circ}\cdot5\text{C.}$, or at $20^{\circ}\cdot5$ absolute. Since the first experiments published on this subject it has been found that fluorine which is perfectly free from hydrofluoric acid does not attack glass at the ordinary temperature; hence it is now possible to enclose a definite volume of fluorine in a thin-walled glass vessel, and to submit it to the powerful cooling action furnished by the ebullition of liquid hydrogen.

A sealed glass tube filled with fluorine and placed in liquid oxygen, boiling quietly under the atmospheric pressure, showed no trace of condensation. The same tube was lowered slowly into a double-walled vessel containing liquid hydrogen, so as to obtain a progressive cooling. A yellow liquid first appeared, which, after plunging wholly into the liquid hydrogen, froze to a yellow solid. On leaving the tube for some time in the liquid hydrogen, so that the temperature of the fluorine was cooled down to $20^{\circ}\cdot5$ absolute, the solid fluorine, originally yellow, became white, resembling in this respect chlorine, bromine and sulphur. Experiments with liquid nitrogen showed that the melting point of fluorine is below -210°C. , and a comparison with the melting point of oxygen, 38° absolute, showed that 40° absolute, or -223°C. , is the most probable value for the melting point of fluorine. The ratio of the melting point to the boiling point is a little smaller than the ratios given by chlorine and bromine.

Experiments were also directed to another point, the question of the affinity of bodies for each other at low temperatures, and in view of the fact that fluorine possesses more powerful affinities than any other elements, it was interesting to determine whether any action was possible between liquid hydrogen and solid fluorine, both maintained at a temperature of $-252^{\circ}\cdot5$. In order to realise this experiment, a thin glass tube was taken containing about 50 c.c. of gaseous fluorine, which had been completely freed from hydrofluoric acid, the gas completely solidified in one of the points of the tube, and this then immersed in a hundred cubic centimetres of liquid hydrogen. When the temperature of the whole was lowered to that of the liquid hydrogen, the point containing the fluorine was broken off without removing the tube, so as to allow of contact between the hydrogen and the fluorine. A violent explosion was the result, sufficient heat being set free to raise the material to incandescence and to set fire to the hydrogen. The explosion was sufficiently powerful to reduce the fluorine tube and the double-walled hydrogen vessel to powder.

Helium is now the only gas which has not been obtained in the solid state.

THE ACCUMULATION OF METEOROLOGICAL OBSERVATIONS.

PROF. HANN contributes to the *Meteorologische Zeitschrift* for January a translation into German of that portion of Prof. Schuster's address before the British Association at Belfast (*NATURE*, vol. lxxi. pp. 614-618) which deals

with meteorological observations, and adds some comments from which the following extracts are translated.

Prof. Schuster's point of view is that of the theoretical physicist, and it is consequently different from that of the meteorologist, who cannot leave the demands of practical life out of account.

The professor's remarks as to the desirability of short and systematic series of observations for the study of definite problems, that is to say, the introduction of a kind of experimental method into meteorology, will certainly meet with universal approval, but this has already been done in several cases (study of thunderstorms, effect of forests on climate, &c.). Simultaneously with such special observations the regular "routine observations" need in no wise be neglected; they appear to us to be indispensable.

Complaints as to the superabundance of meteorological observations are not new; it may be a quarter of a century since we read in an English periodical: "The need in meteorological science now is not observations, but brains to work out the results." It cannot be denied that there is some justification for this point of view, but it must be borne in mind that by reducing the number of meteorological records the number of "brains" who would discuss already available observations would hardly be increased.

A small amount of consideration will further show that the question of a temporary suspension of meteorological observations cannot be regarded as a practical one. The central institutions could take no such step, for they are not intended solely, or even primarily, to serve the ends of pure science, but chiefly to meet the demands of practical life, which would not brook the interruption of observations for a lustrum. The answer given by Sir George Airy before a Treasury Committee appointed to inquire into the expenditure of the grant in aid of meteorology is characteristic in this connection. Asked whether there were reasons for continuing the publication of the detailed daily reports from the seven (first-class) observatories, Airy replied: "It is desirable they should be preserved, I think; and there is one point which is worth considering, and that is that the public feeling in favour of meteorological publications is very strong. . . . I get a great number of letters and applications of all kinds from persons that I know nothing about. Few requests are made for astronomical information. A greater number are made for magnetic information, but that is to a great extent for practical purposes; but I think that by far the greater number are for meteorological information. . . . Popular feeling is an element not to be put out of question in matters of this kind." This from the same Airy who later on expressed the wish "that an absolute stop should be made from time to time in order to give what I venture to call breathing time." But practical and scientific demands alike pass over such desires.

Had Prof. Schuster ever been at the head of a meteorological office, he would know how constantly public authorities, to say nothing of private individuals, demand authentic meteorological data; he would then be able to estimate what public opinion would say if the director answered: "I have discontinued meteorological observations for five years, to obtain time and opportunity for discussing existing records."

Even if official observations were suspended, private observations would be continued, and a state of affairs would again be brought about similar to that which obtained before the introduction of an organised system of observation. Unchecked observations would be made with untested and badly exposed instruments, and a real waste of time would result, nay more, in many cases positive harm might be done by the circulation of inaccurate data. A natural interest, which has undoubtedly done good service in the past, would also be checked.

As regards the publication of results, it is only by means of such publications that it is possible on the one hand to exercise satisfactory supervision over the observations, and on the other to give all who desire it the opportunity of making use of existing records. To bury the results where they would be accessible only to the staff of an office would be a waste that would indeed justify complaints.

Least of all can we understand how Prof. Schuster could mistake the value of continuous homogeneous records or

¹ A paper, by Profs. H. Moissan and J. Dewar, read before the Paris Academy of Sciences, March 16.